

# Accelerating HPC Applications through Specialized Linear Algebra Clouds, Phase I

Completed Technology Project (2011 - 2011)



## Project Introduction

Cloud computing has the potential to permit scientists to scale up to solve large science problems without having to invest in hardware and software infrastructure. Even though its use has become commonplace in the business realm, its use in HPC is still limited to a few applications. This project aims at developing, prototyping, validating, and commercializing the world's first cloud-enabled acceleration library of linear algebra solvers. Considering that linear algebra is the most common computational bottleneck in scientific software applications (more than 70% of HPC cycles), the resulting Specialized Linear Algebra Cloud technology will directly impact numerous applications, such as the design of aerospace and automotive vehicles, exploration for new oil & gas reserves, nuclear energy research, and the design of computer chips, among many others. The Phase I work will incorporate innovations for removing the bandwidth bottleneck in the outsource model of a Specialized Linear Algebra Cloud. We will also design a core platform able to support solver-as-a-service technology in HPC environments. The Phase I technology will be evaluated in three different scenarios: (A) Infrastructure Cloud outsourcing computations to Specialized Clouds, (B) Infrastructure Cloud making use of internal Specialized Clouds, and (C) End-users accelerating code through direct access to Specialized Clouds. Accelogic's novel numerical libraries are expected to provide next-generation speed/efficiency to existing cloud systems, with direct application to NASA programs, other government applications, and many valuable uses in academia and the private sector. The Phase I proof-of-concept work should advance the technology from TRL 2 to TRL 3, and we expect to reach TRL 5 during Phase II. A world-class combination of experts in algorithm design, computer networks, and numerical analysis pursue these development goals.



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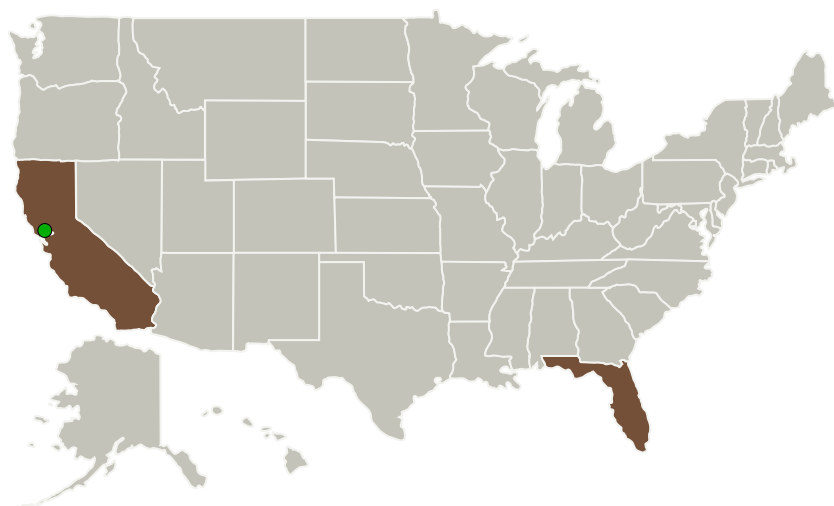
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Accelogic, LLC	Lead Organization	Industry	Weston, Florida
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Florida

## Project Transitions

▶ **February 2011:** Project Start

✓ **September 2011:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137940>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

Accelogic, LLC

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

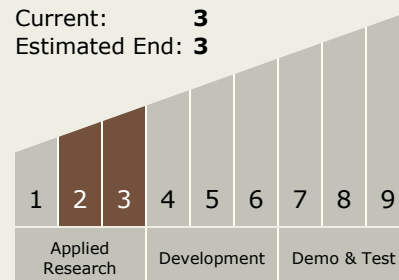
Carlos Torrez

## Principal Investigator:

Juan Gonzalez

## Technology Maturity (TRL)

Start: 2  
Current: 3  
Estimated End: 3



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## Technology Areas

### Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - └ TX11.6 Ground Computing
    - └ TX11.6.2 Automated Exascale Software Development Toolset

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System